

Tech Talk

EUROPEAN CONVERSION

What are the electrical questions to ask when importing a boat from Europe to Canada?

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The ability to source and purchase a boat online has been a game changer in the marine industry. Boat buyers not only have the ability to choose from a global selection of makes and models but can also take advantage of fluctuating currencies and

lower duties. The current duty rate for importing a pleasure craft into Canada is 9.5 percent, plus the import GST. However, once the boat is in Canada, the boat's AC electrical system might not be compatible to our North American AC electrical standards.

European shore power generally runs at 230 volts and 50Hz frequency with amperage ratings of 16, 32 or 64. North American single phase shore power runs at 120 or 240 volts and 60Hz frequency with amperage ratings of 15, 30, 50 and 100. (Note: Some North American boats also have three phase at 208 volts).

The majority of the world runs at 230 volts and 50Hz. The advantage of a higher voltage means that you can design your boat's wiring

system using smaller gauge wire and save wiring costs. For example, 120-volt at 20 amps or 240-volt at 10 amps will both give you 1,000 watts, notice that as the voltage is doubled the amperage is reduced by half.

A boat that is wired for the European market is not compatible with North American AC electrical standards and will not be able to connect to shore power. First, we will look at the major differences between these two systems and then we will look at a couple of different solutions. When you are looking at a boat, consider the year of manufacture and the electrical specs.

ELECTRICAL APPLIANCES
Some appliances can run at either 50Hz or 60Hz with

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voltages ranging from 100 to 240. They must be dual-frequency and multi-voltage or they will not work. If the boat was built pre-1990, it is less likely to have dual-frequency appliances. Many fridge and air-conditioning motors and compressors can be sensitive to the wrong frequency and could overheat.

GENERATORS Newer AC generators can usually be converted, but the older generators may not offer this option. Conversion also changes the speed at which the generator operates at and may increase the noise level when going from 50Hz to 60Hz. One desirable feature of conversion from 50Hz to 60Hz is an increase in the power available by 15 to 20 percent.

INVERTERS Manufacturers build inverters for a certain amount of current, voltage and frequency measured in hertz or cycles. There are several things that can happen if you run a higher electrical current through a 50Hz inverter. A connected AC motor runs slower, the internal current increases, the wattage decreases and the cooling decreases causing the insulation to deteriorate and it could burn-out and catch fire.

ELECTRICAL OUTLETS European boats are designed with European appliances in mind and have receptacles that are different from North America. If you are intending on using the boat around the world, then you could install a smaller, separate AC panel with a few

North American receptacles in areas such as the galley to run some AC appliances and charge electronics. Otherwise, you will have to replace the receptacles and the wiring.

WIRE SIZE A European 230-volt, 16 or 32-amp service wiring will be too small to run at 120-volt or 120/240-volt, 30 to 50-amp service.

CIRCUIT BREAKERS Circuit breakers need to be sized accordingly to protect the conductors they are connected to. Consideration should be given to this during a retrofit and during the assessment phase.

BATTERY CHARGERS Most modern battery chargers will work fine on just about

any voltage source and frequency. Be wary of older units that use transformers, which may need to be upgraded.

NOW THAT YOU know some differences to look for, what are your options? The first and most expensive option is to completely retrofit the boat. This could mean replacing the shore power receptacle, main AC panel, and wiring depending on what components in the system can safely be reused. This works if you have found your forever boat at a great price and in great condition. It also makes sense if you don't intend to leave North American waters and have no need to run both the 50Hz and 60Hz systems.

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that route, the second option is to install an isolation transformer designed to boost the 120 volts to 240 volts. Specific isolation transformers can raise the shore voltage to deal with voltage drop and can be used to adapt the vessel's internal power system voltage to a higher or lower shore power supply. This seems like a very easy solution, however, isolation transformers are expensive. They are also made of significant amounts of iron and copper, both of which are not light materials. A typical 120-volt/30-amp transformer can weigh almost 100 pounds while a typical 240-volt/50-amp unit weighs almost 300 pounds. The reason for the weight and size issue is the low frequency of our power grid, 60 cycles. On the positive side, using an isolation transformer does enhance electrical safety and mitigate galvanic corrosion issues related to ground currents from shore.

Also, a traditional transformer is not that versatile and could require complicated switching arrangements or rewiring to allow it to perform multiple tasks like boosting voltages. This will provide compensation for line voltage fluctuations but it doesn't provide full protection from spikes or over-voltage conditions. Keep in mind, some specific isolation transformers can convert 240 volts to 120 volts or vice versa but no transformer can convert from 50Hz to 60Hz. Therefore, all AC appliances, when connected to a North American shore system, will have to be able to run at 60Hz.

If you are planning on

boating around the world, the third option is to install a new AC sub-system and, in essence, run two complete and parallel systems. The sub-system would be powered by batteries and would be capable of running light AC loads or intermittent loads but no large AC loads such as hot water or an AC water maker. The primary purpose of this system is to use an inverter to run your European AC loads and then a new charger to replenish the batteries and offset the DC draw used to run the inverter. Basically, the batteries act as a translator allowing the inverter to power your European AC appliances and the charger connected to North American shore power replenishes the battery. Realistically, this approach will only give you 10 to 15 amps of intermittent AC service.

Boating around the world has become far more accessible and there are more and more realistic options available than ever before. Many boaters are embracing the idea of purchasing a boat overseas and cruising for a few years before returning home with the same boat. 

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